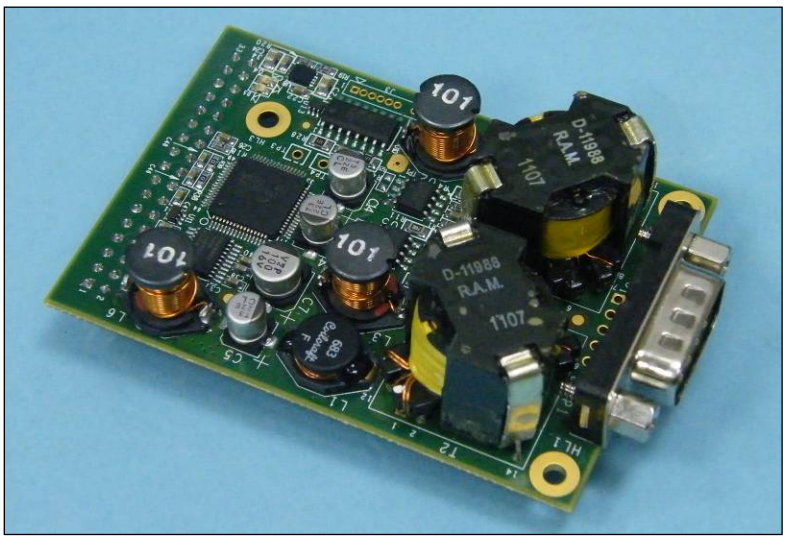
NANOMOTION

A Johnson Electric Company

User Guide
XCD-HR
Controller/Drivers



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One or more of the patents listed in the following table may apply to Nanomotion products.

5,453,653; 5,616,980; 5,714,833; 111597; 5,640,063; 6,247,338; 6,244,076; ,747,391; 6,661,153; 69838991.3; 6,384,515; 7,119,477; 7,075,211; 69932359.5; 1186063; 7,211,929; 69941195.5; 1577961; 4813708; 6,879,085; 6,979,936; 7,439,652; 7061158; 1800356; 1800356; 1800356; 2007-533057 (pending); 2011-093431 (pending); 7,876,509; 10-2007-7009928 (pending); 200780019448.6; 7713361.9 (pending); 12/294,926 (pending); GB2008000004178 (pending); GB2009000003796 (pending); 12/398,216 (pending); GB2446428; 12/517,261(pending); 08702695.1 (pending); 10-2009-7017629 (pending); 12/524,164 (pending); 12/581,194 (pending)

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Revision History

ECO	Revision	Release date	Details
EC-727	00/A		Revised XCD0458000-00 by incorporating XCD-HR8 and XC-HR16 boards in the document and changing the title and doc number

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1 About this Guide

1.1 Scope

This user guide provides the required information for interfacing with the XCD-HR family of Controller/Drivers. These include:

- XCD-HR1
- XCD-HR2
- XCD-HR4
- XCD-HR8
- XCD-HR16

1.2 Intended Users

This user guide is intended for engineers or technicians directly involved in installation, operation and maintenance of positioning systems and control systems.

Use the XCD HR1, HR2, or HR4 Controller Driver only for the purposes and tasks described in this manual, or in related documentation.

Always perform tasks according to the instructions provided in the documentation.

1.3 Reference Documentation

- XCD Software User Manual (same version as FW installed on card)
- XCD HR Motherboard User Guide, D/N: XCDH458001.
- HR 1 Motor User Manuals, D/N: MSP1458000
- HR 2 Motor User Manuals, D/N: MSP2458000
- HR 4 Motor User Manuals, D/N: MSP4458000
- HR 8 Motor User Manuals, D/N: MSP8458000
- FB Positioning Systems User Guide, DN

Safety

Electrical Shock Hazard

The XCD-HR Controller/Drivers have high voltage that is a personnel safety hazard.

2 Overview

The XCD HR family of Controller/Drivers are single-axis, compact motion controllers operating in a linear drive mode. The controller driver provides positioning control for one axis, with configurable motion profile and servo parameters.

They are designed to control Nanomotion HR motors (HR1, HR2, HR4, HR8, HR16).

The XCD HR Controller/Drivers can be installed on a Nanomotion motherboard (part number XCDH150100) or completely within a customer developed system.

All XCD-HR Controller/Drivers are factory programmed with a NM proprietary XCD Motion Script (XMS) program. With the XMS, the user can define a complex sequence of motions along with sophisticated calculations and execution control. The user can store a preprogrammed XMS program in the controller's flash memory, and execute it at power up. For information about the XMS program and scripts refer to the latest XCD FW user manual.

The XCD HR famile of controller/drivers supports the following main features:

- Motor Interlock mechanism
- RS232 serial communication
- Limit Switch
- 4 GPIO lines
- 3 Anlog inputs
- Emergency Stop input signal

Configurations

The XCD-HR Controller/Drivers are available in two configurations. The standard configuration is designed for use with the Nanomotion motherboard, part number XCDH150100. The second configuration is designed for use in the Nanomotion XCD 4X Controller/Driver box.

Standard	XCD-4X Box
XCD-HR1-BD-04	XCD0150103
XCD-HR2-BD-04	XCD0150203
XCD-HR4-BD-04	XCD0150403
XCD-HR8-BD-04	XCD0150803
XCD-HR16-BD-04	XCD0150163

3 Technical Data

Dimensions: 52mmx70mmx13mm.

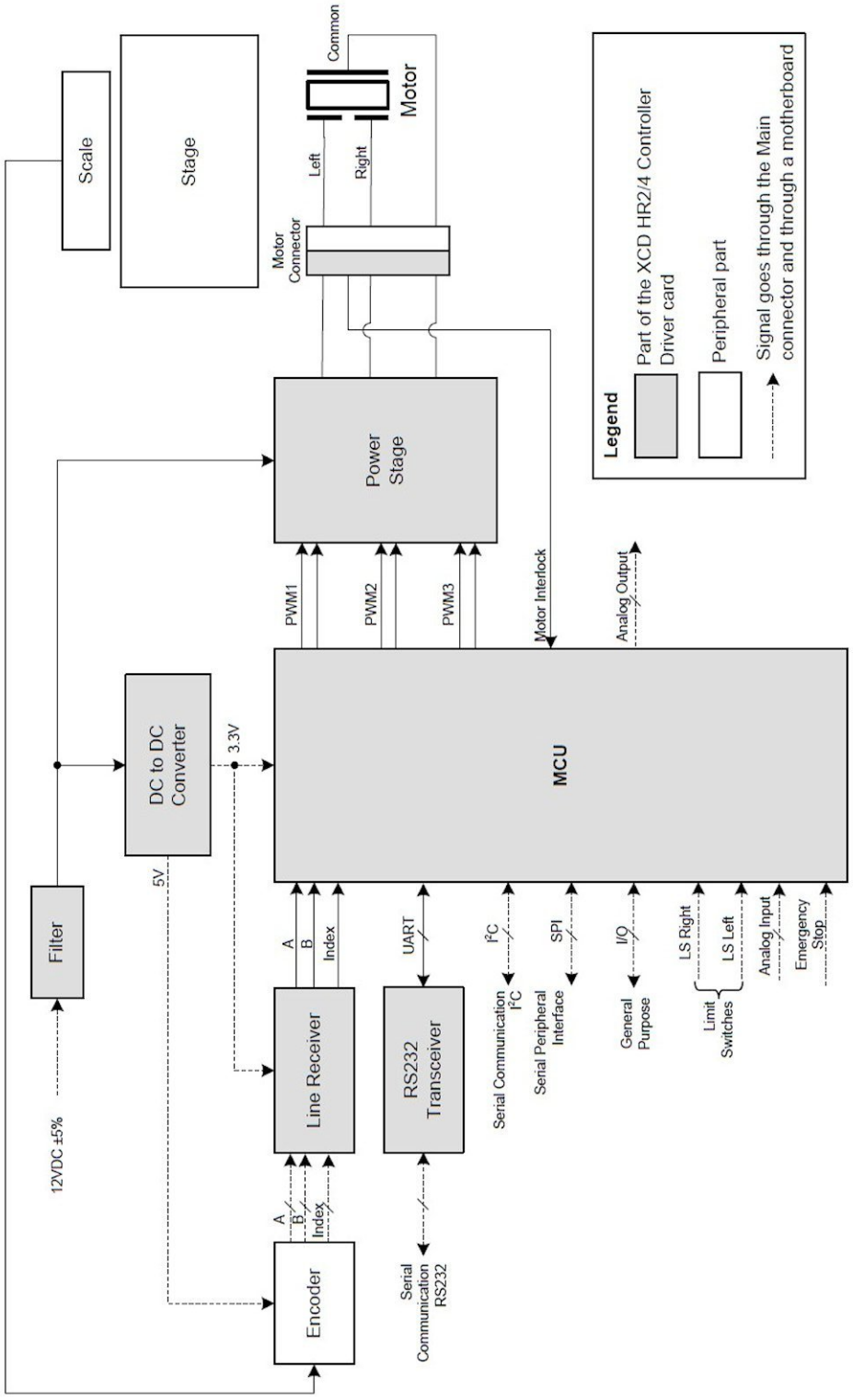
Electrical:

- Input power supply voltage:
  - XCD-HR1/2/4: 12V DC ±5%
  - XCD-HR4/8: 24 VDC
- Maximum power consumption:

Controller/Driver	**Max power consumption**
XCD-HR-1	7.5W
XCD-HR-2	15W
XCD-HR-4	30W
XCD-HR-8	60W
XCD-HR-16	120W

Operating Temperature: 0ºC to +50ºC

Storage Temperature: -40ºc to +50ºc



The XCD HR Controller Driver Block Diagram

4 XCD HR Controller Driver Interface

This section provides the required information for interfacing with any of the XCD HR Controller Driver.

4.1 Functional Interface

Controlling the HR Motor through one of the XCD HR Controller Driver, using the XCD HR Motherboard.ting an HR1/2/4 motor requires a setup consisting of the following components:

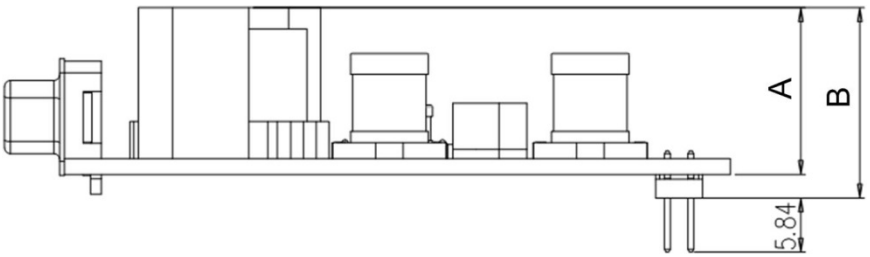
- A host PC, running the XCD Commander application. This application is developed especially for evaluation and development purposes.
- An XCD HR Motherboard: either the XCD HR Motherboard, P/N: XCDH150100 or a user-customized motherboard, that meets the interface requirements, as specified in section 0.
- An XCD HR Controller Driver.
- A single axis NM stage (or user-customized power stage) with mounted HR1/24 motor.
- A DC power supply – 12 VDC for XCD-HR1/2/4, 24VDC for XCD-HR8/16

4.2 Mechanical Interface

The XCD-HR Controller/Drivers have two connector configurations.

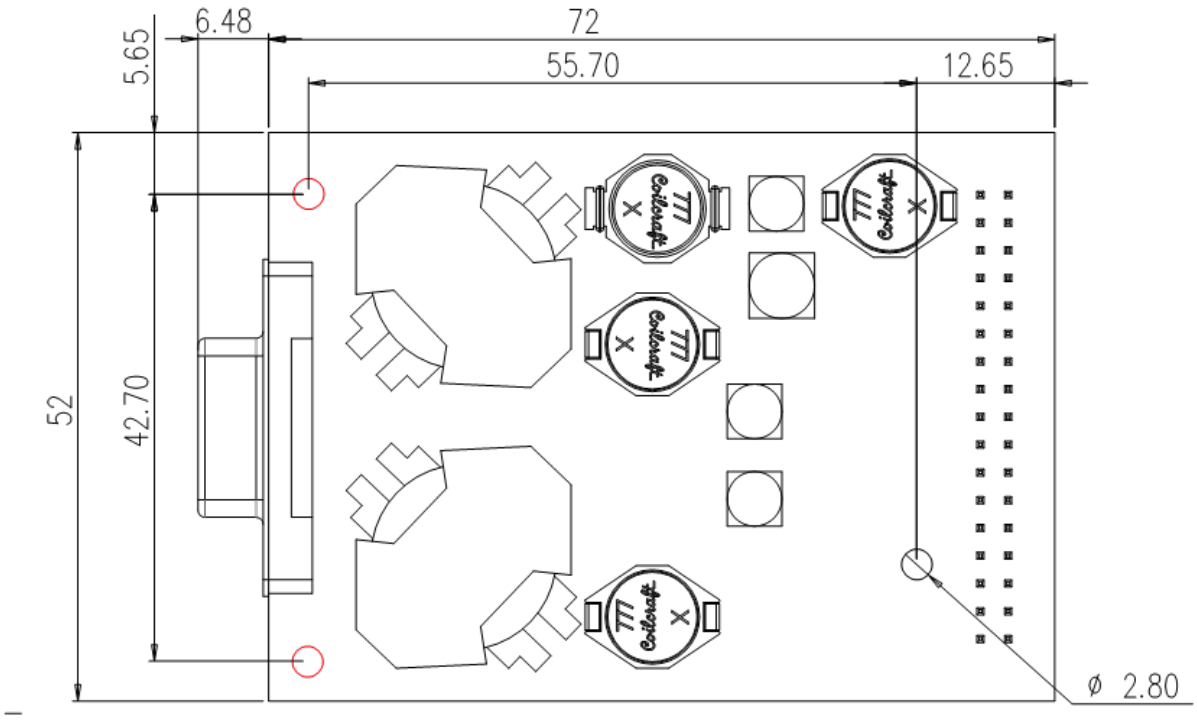
- Standard configuration - designed for use with the XCD-HR Motherboard (part number XCDH150100) or customer designed interface
- XCD 4X configuration - designed for use with the XCD 4X Controller/Driver box

The drawings below do not show all the power supply connector for the XCD-HR8 and XCD-HR16. The external dimensions for the two configurations is the same.



XCD HR Controller Driver Card - Side View

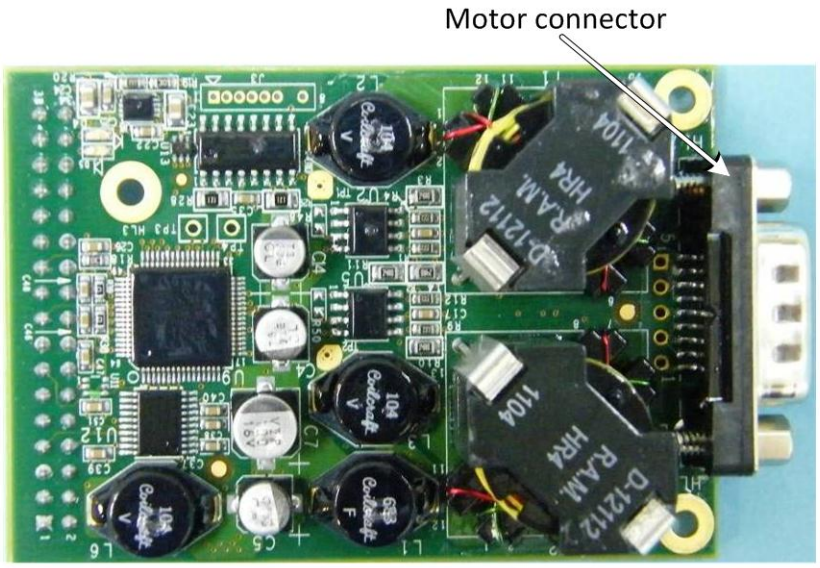
Standard	XCD-4X Box	Dimension in mm	
		A	B
XCD-HR1-BD-04	XCD0150103	18	20.54
XCD-HR2-BD-04	XCD0150203	18	20.54
XCD-HR4-BD-04	XCD0150403	18	20.54
XCD-HR8-BD-04	XCD0150803	28.63	24.82
XCD-HR16-BD-04	XCD0150163	28.63	24.82



XCD HR Controller Driver Card - Top View (all dimensions are in mm)

Note:
Install the XCD HR Controller Driver card, using two 2.5X10 spacers, and two M2.5 mounting screws to be inserted in the card mounting holes (marked in red).

4.3 Electrical Interface

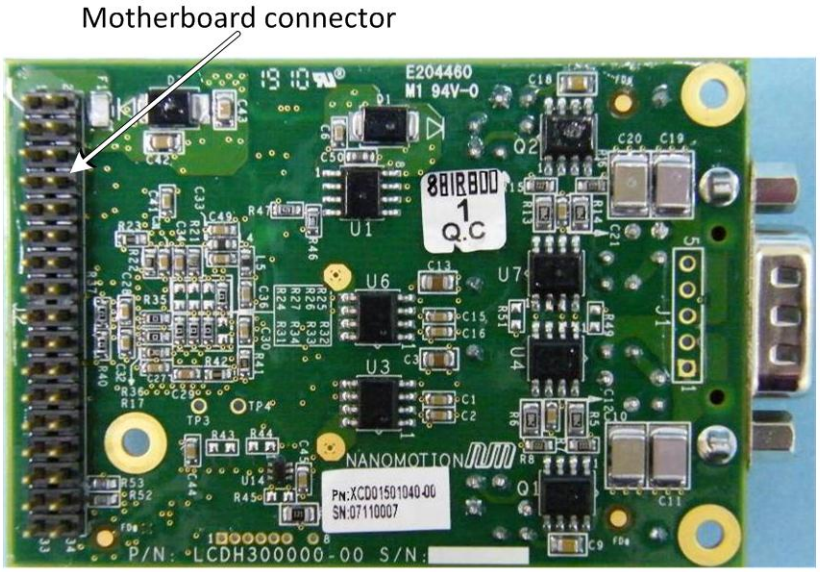


XCD HR Controller Driver Card – Top View

Motor Connector – P1

Motor Connector P1		
Pin #	**Pin Name**	**Function**
1	GND	System ground
3	Motor_up	Connected to the white motor terminal
4	Motor_Common	Connected to the black motor terminal
5	Motor_Down	Connected to the red motor terminal
6	Motor_Connected	Safety input: shorted to pin 1 in order to prevent controller driver's operation without the motor
7	Shield	Shorted to the shield
2, 8, 9	N.C.	Not connected

Motherboard Connector – J3



XCD-HR Controller Driver Card – Bottom View

Motherboard Connector –J3			
Pin	**Name**	**Function**	**Comments**
1	+12V	12Vdc Power Input. Max power consumption 30W	Not connected on XCD-HR8 and XCD-HR16 boards
2	+12V		
3	SPI_CLK	SPI Clock - Future option	
4	SPI_EN	SPI Enable - Future option	
5	MISO	Master In Slave Out	
6	MOSI	Master Out Slave In	
7	RXD	RS232 Receive	The controller receives commands from the host and sends back the replies
8	TXD	RS232 Transmit	
9	GND	System ground	
10	GND	System ground	
11	SDA	I2C Serial data	The controller receives commands from the host and sends back the replies
12	SCL	I2C Serial clock	
13	IO_0	General Purpose Digital Input 1	Voltage level CMOS 3.3V. The customer defines I/O processing in XMS.
14	IO_1	Not connected	
15	IO_2	General Purpose Digital Output 3	
16	IO_3	General Purpose Digital Output 4	
17	AIN0	Analog Input 1	V range: 0V÷3.3V. The customer defines input processing in XMS
18	AIN1	Analog Input 2	
19	AOUT0	Analog Ouput 1	V range: 0V÷3.3V. The output level is defined by monitoring function or by XMS

Motherboard Connector –J3			
Pin	**Name**	**Function**	**Comments**
			script variable AOUT0.
20	AIN2	Analog Input 3	V range: 0V÷3.3V. The customer defines input processing in XMS.
21	AOUT1	Analog Ouput 2	Function monitoring
22	EMERG.	Emergency Stop	CMOS 3.3V
23	+5V	5Vdc Power out	200 mA max
24	PWM_OUT	Keep alive	For testing puposes
25	A+	Incremental signals	CMOS 3.3V
26	LS Left	Limit switch left	CMOS 3.3V
27	A-	Encoder incremental signals	CMOS 3.3V
28	LS Right	Limit switch right	CMOS 3.3V
29	B+	Encoder Incremental signals	
30	INDEX+	Encoder Reference Mark / Positive Signal	
31	B-	Incremental signals	
32	INDEX-	Encoder Reference mark / Negative Signal	
33	GND	System ground	
34	GND	System ground	

XCD-HR8/HR16 Power Connector

The power connector is mounted on the top (J4) or bottom (J6) of the board depending on the intended interface.

Assembly Part No.
XCD0150802
XCD0150162

Assembly Part No.
XCD0150803
XCD0150163

Power Plugs on XCD-HR8 and XCD-HR16 Boards

Power Connector, J4 – Standalone Configuration		
Pin	**Name**	**Function**
1	+24VDC	Power Input. Max power consumption 120W
2	+24VDC	
3-8	NC	Reserved for future use
9	GND	System ground
10	GND	
Power Connector, J6 – Motherboard Configuration		
Pin	**Name**	**Function**
1	GND	System ground
2	GND	
3-8	NC	Reserved for future use
9	+24VDC	Power Input. Max power consumption 120W
10	+24VDC	